Variations in Maternal Play Behaviors Affected by Hearing Status

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Introduction

Parent-child play sets the stage for later development. Through play, children learn about the world around them, including how to be a social agent (Piaget, 1954). Caregivers scaffold development through play by being attuned to where the children are developmentally (Marjanovic-Umek & Peklaj, 2017). Caregivers differ in their play behaviors, including variation in language input, play strategies, and interaction complexity. Variables that have been identified to affect parenting styles include parental mental health, socioeconomic status, and self-regulation (Kiss et al., 2014). Children's hearing loss is another factor that could potentially affect parenting styles (Fagan et al., 2014), which creates a communication gap, as 90% of children born with a sensorineural hearing loss are born to normal hearing parents (Albertini, 2010). Previous research suggests that children's hearing status strongly affects the language that parents use during play (Cruz et al., 2013; Pressman et al., 1999). However, little research has explored if parents also adjust their play behaviors in response to their children's hearing loss. The current study investigated maternal play behaviors with children with cochlear implants (CIs) and children with normal hearing.

A developmental gap exists between children with normal hearing and children with CIs, particularly during the first year after implantation. For children with normal hearing, their hearing experience matches their chronological age. Children with CIs, however, gain access to sound at an older age. This creates a gap between their "hearing age" and chronological age. For example, a 24-month-old child implanted at 18 months has a hearing age of only 6 months. Before implantation, these children do not hear a model of language that would help them imitate language, often leading to a language delay (Laugen et al., 2016). Because play and language are so closely related (Tamis-LeMonda & Bornstein, 1990; Werner & Kaplan, 1963; Wolf &

Gardner, 1981), we must also question if play behaviors are impacted by hearing loss. This study explores if parents adapt their play behaviors to children's hearing status, asking specifically if mothers are more sensitive to chronological or hearing age when playing with children with CIs. The aim of the current study was to systemically observe and categorize maternal play behaviors of three participant groups. This study seeks to be an initial stepping stone in identifying effective maternal play strategies to utilize with children with CIs in hopes of promoting the development of children with hearing loss.

Specific parent-child play behaviors can be seen around 6 months of age, when newly learned motor skills allow children to interact with their environments more intentionally. Play begins as dyadic, face-to-face interactions between caregiver and baby (Bakeman & Adamson, 1984). Caregivers and children lock in attention with one another in these early stages of development, as the child learns to communicate with their caregiver (Bakeman & Adamson, 1984). At six months of age, parents and children can coordinate their exchanges with each other by matching the lengths of pauses between speakers (Beebe et al., 1988). This coordinated interaction timing is critical, as mismatched conversation rhythm has been identified as a risk factor for later language delays (Northrup & Iverson 2015).

As dyadic play becomes more advanced, objects slowly become more central aspects of interactions. Over the first six months, children start to shift their caregivers face to other objects around them (Schaffer, 1977). Object exploration is exemplified by mouthing (Belsky & Most, 1981), dropping, and throwing (Belsky, 1980). The Committee on the Science of Children Birth to Age 8 (2015) found that as children start to explore the objects around them, parents support children's exploration by providing labels for objects and events that catch the child's attention. This supportive parental strategy helps to conceptually categorize different objects. Although

these play behaviors may seem to be without an overarching objective, at least from the lens of an adult observer, this phase of development sets the stage for future play development and exploration (Parten, 1932).

Early social interactions teach children about relationship building skills used with peers and family members (Singer & Singer, 2005). Play and language development have been linked empirically, as the two tend to go hand-in-hand (Tamis-LeMonda & Bornstein, 1990; Werner & Kaplan, 1963; Wolf & Gardner, 1981). Play and language are both thought to stem from the ability to represent symbolic entities (Tamis-LeMonda & Bornstein, 1989; McCune, 1985). Tamis-LeMonda and Bornstein (1990) investigated different components of language related to play, specifically looking at language comprehension and production. Their study of 43 13-month olds found evidence that language comprehension related positively to children's play complexity. This stage of play lays a foundation for later development. Children who receive CIs in toddlerhood miss out on auditory information from their caregivers during these early months. It is unclear how this lack of early auditory input affects parent-child play during the toddler years.

Parent-child interactions grow in complexity over time, in response to children's newly emerging skills. Parten (1932) described play for 24-month-olds with normal hearing as solitary play. Solitary play is characterized as children playing alone with different toys, uninterested and/or unaware of other's actions around them. When considering parent-supported play interactions, however, Adamson and colleagues (2004) observed that 24-month-old children and their parents shared attention as the parents focused children's vision attention on an object. As children mature, parents encourage children's increasing sense of initiative and autonomy by taking a "backseat partner" play role (Featherstone & Cummings, 2009). Toddlers begin to learn

social skills through practicing listener and speaker roles (Fey & Leonard, 1983; Kaczmarek, 2002). Both dyadic and object play continue to progress through toddlerhood as children shift from "interactions to conversations" (Adamson et al., 2014).

Socially, object play allows children to share an experience centered on an object with a caregiver. As children share object-centered experiences with caregivers, they practice the skill of turn-taking. Like rolling a ball, play partners must alternate appropriately between performing an action and waiting for their partner's response. Practicing turn-taking improves coordinating appropriate timing of an interaction with a play partner (Elkind, 2008). Without this coordinated timing of behaviors, interactions feel awkward and choppy. Typically developing children seamlessly acquire object play skills upon their foundational dyadic play skills. For children with CIs, there remains an open question as to how caregivers will approach these interactions.

As children include toys in their dyadic interactions, caregivers remain a valuable aspect of parent-child interactions regardless of hearing status. The quality of dyadic interactions is a fundamental aspect of child's play (Brazelton & Greenspan, 2000; Singer & Singer, 2005). The quality of such interactions is largely determined by the role and behaviors of the parent. Additionally, positive child development has been linked with parental affection, responsiveness, autonomy support, and teaching during play (Wooldridge & Shapka, 2012). Parents create a play environment in which the child's own play behaviors can develop. When with a caregiver, children play more and use more varied play behaviors (Hirsh-Pasek & Golinkoff, 2004). These behaviors led to higher social and emotional outcomes in children (Carpendale & Lewis, 2004; Shonkoff & Phillips, 2000). Because parents' actions are so impactful on parent-child interactions, caregivers' play behaviors should be investigated and analyzed. Maternal play

behaviors are extremely valuable in parent-child play, motivating our focus on how those behaviors differ between different groups of children.

Parents adjust their play behaviors to the developmental abilities of their normal hearing children while interacting. In the context of play, caregivers can display sensitivity to their child by how facilitative or supportive they are. Roos and colleagues (2016) observed that parents assume their children can communicate early in life; however, parents take the child's competence into account while interacting. Parents physically orient their child to be able to see an item of interest. As children's play progresses, parents adjust their own play patterns, which allows for more child autonomy (Marjanovic-Umek & Peklaj, 2017). The need to completely guide an interaction decreases; instead, caregivers support and supplement an interaction. Children become more self-guided and take the lead while engaging with a responsive caregiver, and eventually, a third object (Ratner & Bruner, 1978). Object play allows caregivers to take a less involved role in play, sometimes observing or commenting on children's manipulation of an object (Adamson et al., 2004). The caregiver role shift from facilitator to supporter allows for more exploration of play from the child (Marjanovic-Umek & Peklaj, 2017) as object play develops. Parents' roles transition when it is most appropriate for their child specifically. Parents' sensitivity to their child remains active, adjusting their behavior to the needs of their child.

Parents potentially take into account their child's hearing status when adapting to their child's play abilities. Because 90% of hearing impaired children are born to normal hearing parents (Albertini, 2010), a communication match exists (Cruz et al., 2013). This mismatch creates an impedance for effective communication (Pressman et al., 1999). Normal hearing parents' interactions with Deaf or Hard of Hearing children are often shorter, characterized by

more miscommunication, and more likely to be dominated by the parent when compared to dyads of matched hearing status (Pressman et al., 1999). However, caregivers also demonstrate subtle adjustments in their interactions that reveal a sensitivity to the development of their child with hearing loss (Bakar et al., 2010; Laugen et al., 2016). Caregivers adjust their vocal styles, like pitch level, to children with CIs more similarly to children matched by hearing age than by chronological age (Bergeson et al., 2006). This study supports the idea that caregivers are more sensitive to their child's hearing age, or length of access to sound, than the chronological age of their child. Parents are able to interact with a chronologically older child but maintain an earlier-developmental style of vocal interaction to best facilitate engagement and language. In sum, hearing loss presents an additional factor that may influence parents as they interact with their children. Parents not only accommodate to children's chronological age, but may also make subtle adjustments based on children's hearing age.

Although effects of hearing loss on language have been studied, little is known how hearing loss specifically affects maternal play behaviors. It remains unclear if mothers of children with CIs play more like mothers of children with the same chronological age or hearing age as them. Perhaps mothers use more object play to "catch up" to the object play stage of normal hearing age matched peers. In contrast, they may use more dyadic play to adjust to their hearing experience of only 6 months. The current study was designed to see whether mothers play behaviors with their children with CIs 6 months after activation would align more closely with the play behaviors of the mothers of normal hearing children matched either on hearing or chronological age. Two possibilities exist. If parents modify their play behaviors to take into account children's newly gain access to sound, we may expect parents to engage in more dyadic face-to-face vocal exchanges, akin to that of that of a mother with her 6 month old. In contrast,

parents may play with their children more closely aligned to children's chronological age given that children have more advanced motor and cognitive skills to engage in more advanced play. Given previous research that supports parents adapt their vocal input to children's hearing age, I predict parents will likewise accommodate their play based on children's hearing age.

Method

Participants

The sample reported here was drawn from a larger longitudinal study at Indiana University by Tonya Bergeson and colleagues to investigate properties of mothers' speech to infants with cochlear implants and normal hearing. Data from 30 parent-child dyads are reported in this study. All mother and infant pairs were recruited from a large metropolitan area. They were divided into three cohorts based on hearing status and age. A group of children with CIs was matched to two normal hearing groups, based on either chronological or hearing age. All mothers included in the experiment had normal hearing. Families came into the lab for multiple sessions, spanning over a few months to a year. The current study looks at data collected for all subjects at the six-month lab visit determined by hearing status and age.

CI Group

At time of testing, all children with CIs (n=12) had six months of hearing experience with their implant(s), allowing for an adjustment period for the child. Of these twelve children, six were female. This group had an average age of 20.4 months (*SD*= 2.56). One child identified as African American, seven children as Caucasian, one child as Hispanic, and one child as biracial. Three of the mothers had completed college or beyond (one did not provide a response), and four of the fathers had completed college or beyond (two did not provide a response). Five of the mothers were homemakers, while six of the mothers work outside of the home (one did not

provide a response). Three of the participants with cochlear implants were implanted in their right ear, one implanted in their left ear, and five were implanted in both ears. Implantation data for the other three participants was not available. The cochlear implants used were Nucleus (n=1), Nucleus 5 (n=4), Nucleus Freedom (n=1), Nucleus Freedom-Contour Advance (n=2), and Hires 90K Focus (n=1). Processing strategies for the implants used were ACES (n= 4) and Hires (n=1); CI data for the other participants was unavailable.

Normal Hearing, Chronological Age Matched (NH-CAM) Group

The children with CIs were matched to eleven normal hearing participants (four females) based on chronological age. This group had an average age of 20.76 months (*SD*= 3.81). Nine children identified as Caucasian, one as biracial, and one did not specify. Six of the mothers had completed college or beyond, and 8 of the fathers had completed college. Three mothers were homemakers, while seven of the mothers worked outside the home (one did not provide response). Each child with CIs was matched to a child in this group based on chronological age.

Normal Hearing, Hearing Age Matched (NH-HAM) Group

Children with CIs were also matched to seven children with six months of hearing experience (two females). This group had an average age of 5.9 months (*SD*= .47). Seven children identified as Caucasian. Six of the mothers had completed college, and five of the fathers had completed college or beyond. Six mothers were homemakers, while one of the mothers worked outside the home. Each child with a CI was matched to a child in this group based on hearing experience. Due to poor video quality in some cases, only seven participants with normal hearing were able to be used in the current study.

Procedure

The collected data from Bergeson and colleagues' longitudinal project included mothers and children engaging in multiple play sessions, including controlled play, spontaneous play, book reading, and song singing (Bergeson et al., 2006). For the current study, only spontaneous play was analyzed. Spontaneous play is characterized by playing however the dyad sees fit without any guidelines. We analyzed only spontaneous play given our interest in how parents and children interact naturally. Mother-child dyads were digitally recorded during a five-minute free play session in the research lab. These sessions were video and audio recorded.

Parent-Child Play Sessions

Dyads were asked to sit on a blanket during play session. Mothers were instructed to play with their child as they would at home. Toys were provided for the mother and child to play with. Among these toys were a plastic button, a toy key, and a soccer ball. Three stuffed animals were also provided representing a dog, cat, and turtle. The dyads were able to play with these toys freely, or not use the toys at all and instead play face-to-face. The play sessions were initiated and stopped by the researcher after five minutes.

Coding Scheme

A coding scheme was used to characterize the type of play that mothers used. The coding scheme used was adapted from Bakeman and Adamson (1984) and Labrell (1996). All codes were analyzed from a maternal perspective, focused on the parent behaviors while interacting with their children. The categories of play were mutually exclusive, and our coding scheme covered 96% of the available video data, suggesting that the coding categories were quite exhaustive of the range of observed maternal behaviors. After an initial coding of all videos at overarching categories, the video was coded again for the particular subcategories. The current study captured the range of maternal behaviors while engaging in spontaneous play with their

child. All videos were coded by isolating start and stop times with the Datavyu coding software program (Datavyu Team, 2014). The full coding scheme is detailed on Table 1.

Motivation for Coding Scheme

A unique coding scheme was created that best captured the behaviors in the data to assess if parents will accommodate their play based on children's hearing age. A unique coding scheme was needed for this study to answer our research question. Coding schemes used in past studies did not capture all behaviors of dyadic, object play, and independently engaged. Additionally, most existing coding schemes took the perspective of both the caregiver and the child. The maternal behaviors accounted for by the coding scheme correlate well with natural behaviors in spontaneous play. The coding scheme captures specific maternal behaviors while allowing space for families to interact in ways that are unique to their family. Although any perspective could have been adopted, the current study specifically focuses on the mother's influence on play, thereby isolating maternal actions during play sessions for systematic classification.

Object play codes were specifically derived from Labrell (1996). Independently engaged, adult intervention, and adult interruption were adapted from Bakeman and Adamson (1984). Dyadic play subcategories were developed specifically for the current study. I watched videos and recorded specific dyadic behaviors seen in the play sessions. Those specific behaviors were then grouped together to create the subcategories of dyadic play. While the subcategories captured the majority of dyadic play, the code of "not otherwise specified" was intended to account for unique behaviors from family to family not included in the other subcategories.

Dyadic Play

The first overarching code was dyadic play. Dyadic play is characterized by face-to-face interaction between a child and caregiver without any third party objects to guide their

interactions. Specific behaviors within dyadic play were captured with the subcategories (gross motor movement, song, peek-a-boo, tickling, affection, protoconversations, imitation, and not otherwise specified). Gross motor movement (GMM) is movement or coordination of the baby's arms and legs in which mothers initiate, encourage, or maintain the child's movement. Song consists of mothers singing to their children, and also includes the routine of joint "dancing." Peek-a-boo and tickling refer to the traditional routines as well as any variations unique to particular families. Affection is seen in play as hugs or kisses between mother and child. Protoconversations are back and forth babbling noises between mother and child that resemble conversations. This category also includes conversations between mother and child. Imitation takes place any time the mom reenacting speech or an action performed initially by the child. The code "not otherwise specified" allows for creativity in family play, exemplified by a unique game initiated by the mother.

Object Play

Object play captures an interaction including the caregiver, the child, and a third object. Specific functions of play were captured with the subcategories including focalization, functional, relational, creation, and recreation (Labrell, 1996). Focalization is defined by the mother focusing the child's attention towards an object, like shaking a rattle to capture attention. Functional play is utilized when the mom manipulates objects of the same category correctly, like rolling a ball. Relational play is used when the mother uses different types of objects together, like the stuffed dog "wearing" the button on its head. Creation can be seen as the mom using objects in a special nontraditional way, like using a button as a doorbell. Recreation is utilized when the mom uses objects as a pretext to interact physically with the child, like touching the stuffed turtle to the child's stomach.

Independently Engaged

Independently engaged refers to periods of time when the mother not actively engaged with her child. Specific behaviors within independently engaged include the subcategories of break, set-up, and episodes of narration/observational verbalization. The break subcategory was utilized for pauses in play that lasted longer than five seconds. Set-up characterized the mother adjusting the play area, like moving and organizing toys around her or her child. Episodes of narration/observational verbalization are exemplified when mothers comment on their child's action without actively engaging in play.

Adult Intervention

Adult intervention classifies any behavior that addresses infant distress. For example, mothers may step in to soothe her infant during an episode of emotional distress; play must be stopped or paused. Adult intervention accounts for behaviors like the mother picking up the child and soothing while the child is crying.

Adult Interruption

Adult interruption describes maternal behavior that intervenes on the child's actions, specifically resulting in a redirection of attention. Specific behaviors of this code were captured by the subcategories of infant care, repositioning baby, and prohibition. An example of infant care includes the mother managing an infant's spit up. Prohibition refers to discipline or addressing baby's behavior due to concern with something the child is doing. A frequent example includes moments when mothers interceded children from putting a small button in their mouths.

Off-Camera

Off-camera accounts for any extended period of time that was not able to be coded because play was not in view. This code only accounted for .384% of total recorded video time for all videos.

Reliability Coding

The primary coder recoded 20% of the videos, with 97% intra-rater reliability. A second individual coded 20% of the videos with a 90.07% inter-rater reliability.

Results

Percentage of time spent in each overarching play category (i.e., dyadic, object play, independently engaged) are shown in Figure 1. For each play category, we ran an omnibus ANOVA to determine if the groups (CI, NH-CAM, NH-HAM) differed significantly from one another. When appropriate, we analyzed the data using Bonferroni-corrected pairwise comparisons.

Dyadic Play

The main effect of group on percentage of time mothers engaged in dyadic play approached statistical significance, $F(2, 25) = 3.009$, $p = 0.067$. Pairwise comparisons with Bonferroni-corrections were performed, but none reached significance (CI group= 4.438%, NH-CAM= 18.159%, NH-HAM= 22.849%).

Within the dyadic play category, mothers could engage in a variety of specific behaviors. We asked whether moms engaged in similar kinds of dyadic play or whether moms differed by group (see Figure #2). The CI group engaged in song most frequently (32.27% of time), followed by tickling (16.92% of time). Imitation was used least frequently (2.37% of time). In contrast, the NH-CAM group engaged in protoconversations most frequently (37.12% of time), followed by not otherwise specified (21.32% of time). Imitation, like the CI group, was used least frequently

(0.98% of time). The NH-HAM group overwhelmingly engaged in not otherwise specified most frequently (37.44% of time), followed by gross motor movement (21.90% of time). No mothers in this group engaged in Peek-a-boo. In other words, mothers in each group approached dyadic play differently.

Object Play

There was a main effect of group on percentage of time mothers engaged in object play, $F(2, 25)= 4.675$, $p= 0.019$. The CI group (M=72.459, SD=6.696) differed significantly from the NH-CAM group (M=45.717, SD=6.559), p=0.018. The CI group did not differ significantly from the NH-HAM (M= 53.056, SD= 12.487) group. Likewise, the NH-CAM and NH-HAM groups did not differ. In other words, mothers with children with CIs engaged in more object play than the mothers with NH-CAM children.

Within the object play category, mothers could engage in a variety of specific behaviors. We asked whether moms were engaging in similar kinds of object play or whether moms differed by group (see Figure #3). The CI group used focalization the most frequently (31.99% of time), followed by functional play (28.62% of time). Relational play was used about a fifth of the time (21.53% of time) by this group. Creation was used least frequently (5.63% of time). The NH-CAM group also used focalization the most frequently, although at a higher percentage of time (47.03% of time). Functional play was the second most frequent category, just like the CI group (28.62% of time). Recreation was used the least (1.47% of time). The NH-HAM group overwhelmingly used focalization the most frequently (47.03% of time), just like the CI and NH-CAM group. Recreation was used as the second most frequent (24.19% of time). Relational was not used by this group (0% of time). These results show focalization used the most frequently, regardless of group.

Independently Engaged

There was a significant main effect on percentage of time mothers were independently engaged, $F(2, 25)= 7.228$, $p=0.003$. The CI group ($M=11.023$, $SD=3.915$) significantly differed from the NH-CAM group ($M=28.167$, $SD=5.576$) $p=.004$. The CI group did not differ from the NH-HAM ($M=12.288$, $SD=3.138$) group. The NH-CAM and NH-HAM groups differed significantly, $p= .031$. These results show mothers of NH-CAM children engaged in more independently engaged behaviors when compared to mothers of the CI and NH-HAM groups.

Within the independently engaged category, mothers could engage in a variety of specific behaviors. We asked whether moms were engaging in similar kinds of independent engagement or whether moms differed by group (see Figure #4). The CI group used breaks the most frequently (66.858% of time), followed by narration (29.307% of time). Set-up was used least frequently (5.013% of time). The NH-CAM group used narration most frequently (58.756 % of time). Breaks were used as the second most frequent category (30.242% of time). Set-up was used the least (8.165 % of time), just like the CI group. The NH-HAM group used narration the most frequently (59.423% of time). Breaks were used second most frequently (21.323% of time). Set-up was used the least frequently (19.409% of time). Both NH groups utilized narration as the most frequently used subcategory. All groups used set-up the least of the subcategories.

Adult Intervention and Interruption

Groups did not significantly differ on adult intervention (CI group= 4.007%, NH-CAM= .485%, NH-HAM= 1.932%), $F(2, 25)= 1.352$, $p=.277$. A marginal group difference was found for percentage of time spent in adult interruption, $F(2, 25)= 3.140$, $p=.061$. Pairwise comparisons

with Bonferroni corrections were ran, but none reached significance (CI group= 4.104%, NH-CAM= 1.676%, NH-HAM= 7.411%).

Subcategories of adult intervention and interruption were not analyzed, as these behaviors were simply to manage child behavior and the play scene.

Discussion

The current study investigated maternal play behaviors, asking specifically how mothers of kids with CIs play with their children. Two groups of normal hearing participants were also studied to see if mothers of children with CIs played more similarly to moms with chronological age matched or hearing age matched peers. I hypothesized that mothers of children with CIs would adjust their play behaviors to mirror that of mothers with hearing age matched peers.

The hypothesis of this study was supported by data, concluding mothers of children with CIs played similarly to their NH-HAM matched peers in respect to object play and independent engagement. The NH-CAM and NH-HAM groups engaged in similar amounts of object play. A potential explanation could be that the availability of toys in the play session set mothers up to engaged in object play similarly. The presence of hearing loss could have changed that behavior. We found that mothers of children with CIs engaged in an overwhelmingly amount of object play, even more than compared to same-aged peers (NH-CAM). This was particularly interesting, as object play is a more advanced play behavior. Mothers may engage in a more advanced level of play with their children with CIs as a way to "catch-up" their children developmentally to normal hearing peers. Children learn the best at a level that is right above their ability level (Vygotsky, 1978). Based on this principle, mothers may be over utilizing this practice because of their child's hearing loss. This "catch-up" method would be intended to decrease the developmental gap between children with CIs and normal hearing.

Mothers of all groups utilized similar strategies during object play, as focalization was most frequently used. Labrell (1996) outlined focalization to be the most basic of the object play subcategories. Mothers may be engaging in simpler play to build a foundation for more advanced object play like creation. Additionally, objects are fundamentally utilized to grab a child's attention, which is how focalization is used. Regardless of hearing status, mothers chose to engage in the least complex subcategory of object play.

Dyadic play was used differently by each group. The CI group utilized song most often, while the NH-CAM group primarily engaged in conversations, and the NH-HAM group engaged in not otherwise specified. Mothers engaging in more song during dyadic play may be attributed to learned behaviors from speech pathologists or music therapists during therapy sessions. Music is used in therapy as a way to jumpstart mechanisms to process and produce language. Humans, especially children, connect with music by "doing" music by dancing and singing along (Barton & Robbins, 2015). Music can be an area of success for children with CIs because of the various sensory perceptions of input including tactile, visual, and auditory. Children with severe to profound hearing loss can obtain tactile information before implantation, so a CI allows for increased sensory information as auditory input (Gfeller et al., 2011). Song lyrics add auditory sensory information to music, playfully exposing children with CIs to language. In fact, lyrics serve as an advantage in music listening, as preschool children with CIs can recognize a familiar nursery rhyme songs when lyrics were included with the music (Olszewski et al., 2005). Contrastingly, mothers with NH-CAM engaged the most in conversations during dyadic play. We see children at this age of 20 months starting to use language more frequently and combining words together (Boysson-Bardies, 1999). Mothers may be engaging in conversations with their children at this age to further encourage the newfound ability to combine words and freely use

speech. Mothers of NH-HAM children utilized the code of not otherwise specified most frequently. Future studies could investigate the nuances of these episodes more in-depth.

Independently engaged was utilized similarly between the CI and NH-HAM groups, suggesting that the mothers were responding to children's hearing age rather than chronological age. Mothers in both of these groups demonstrated less independent engagement than the mothers in the NH-CAM group. However, NH-CAM and NH-HAM mothers engaged most frequently in narration/ observational verbalization. In contrast, the mothers of the CI group were more likely to take a break during periods of independently engaged. Both normal hearing groups engaged in more narration/ observational verbalization, potentially due to the mothers feeling less of a need to completely guide an interaction. Kondaurova et al. (2015) found that normal hearing mothers of children with CIs used more directive speech during play, potentially because of a communication mismatch based on hearing status. Normal hearing parents may not be confident that their children with CIs can understand their communication, so their speech is direct and to the point. Alternatively, normal hearing parents may feel their language is well heard and effectively communicated to their normal hearing children displayed by NH-CAM and NH-HAM groups. Because of this, mothers with normal hearing children may feel freer to communicate with their child with no instructive goal in mind, like narration of activity in the current study.

There are some limitations of the current study. Poor video qualities led to a small sample size of videos that were able to be coded. The smallest group (NH-HAM) only consisted of 7 participants. Children with CIs were not able to have direct matches in each normal hearing group because of the limited codeable data. For this reason, group differences were analyzed. This study did not analyze the child's behavior, which may have impacted the play of their

caregiver. Play sessions took place in the lab, so mother-child dyads may not have acted as naturally in the lab as they would at home. Further studies could address these limitations.

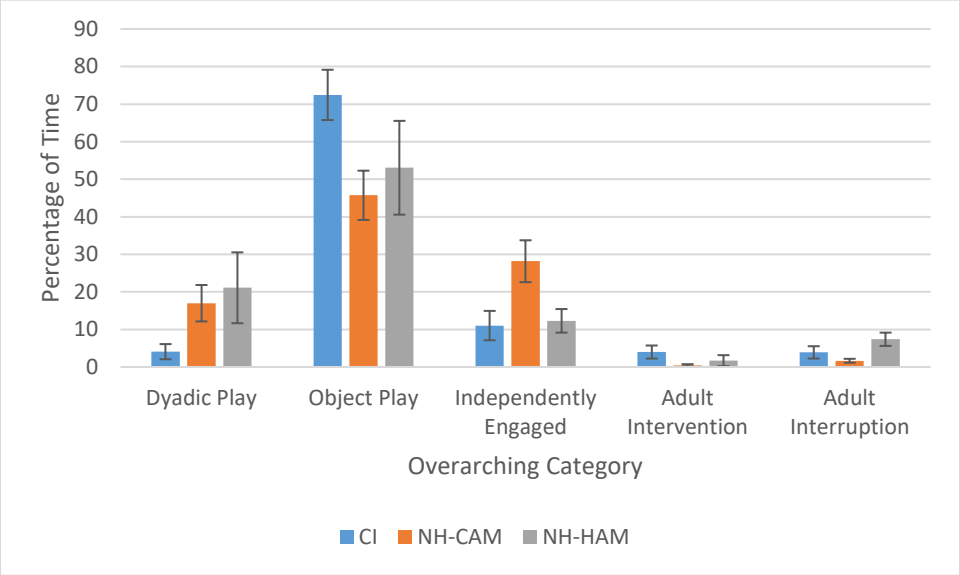
Although there are limitations of the study, the findings lay the groundwork for future research in hopes to decrease the developmental gap between children with normal hearing and CIs. Future studies to address the limitations would be valuable to fully assess maternal play behaviors.

Behavioral Code	**Description**
Dyadic	Interactions includes mother and baby, no outside objects
Gross motor movement	Movement or coordination of arms and legs. Mother initiates, encourages, or maintains such movements of their baby
Song	Mother sings to baby, can include a routine of joint "dancing"
Peek-a-boo	Traditional routine
Tickling	Traditional routine
Affection	Hugs or kisses between mother and baby
Protoconversations/ back and forth conversations	Back and forth babbling noises between mother and child that resemble conversations or conversations between mother and child
Imitation	Mother reenacts an action or speech performed by baby
Not otherwise specified	A miscellaneous category to allow room for variation in types of play amongst different families
Object Play	Interaction includes mother, baby, and third object. Play is defined as mother engaged with a toy

Focalization	Mother focuses the baby's attention towards an object
Functional	Mother manipulates correctly objects of the same category
Relational	Mother uses together different types of objects, may be pretend play
Creation	Mother uses objects in a special nontraditional way
Recreation	Mother uses object as a pretext to interact physically with the baby
Independently Engaged	A lack of interaction or engagement from the mother. A grace period of ten seconds will allow for natural pauses in engagement
Break	A break in the play episode, mother engaged independently from child, could include physically independent of their child
Set Up	Setting up play area
Episodes of Narration/ Observational Verbalization	Mothers comment on their child's action without actively engaging in play
Adult Intervention	Adult steps in to soothe the infant during an episode of emotional distress; play must be stopped or paused. Child must be in distress. Mother must stop play episode and address her child
Addressing distress	Most prevalent example is when child is crying inconsolably
Adult Interruption	Adult intervenes with infant's actions with intentions to ultimately redirect infant's attention. Child is not in distress.
Infant care	Examples include blowing their nose or managing a spit up

Repositioning baby	Directs or physically changes baby's bodily position during play scene
Prohibition	Discipline or addressing baby's behavior due to concern with
Off-Camera	Mother or play is off-camera and is unable to be coded accurately

Table 1. Behavioral Coding Scheme



Note: Error bars represent standard error.

Figure 1. Mean Differences by Group

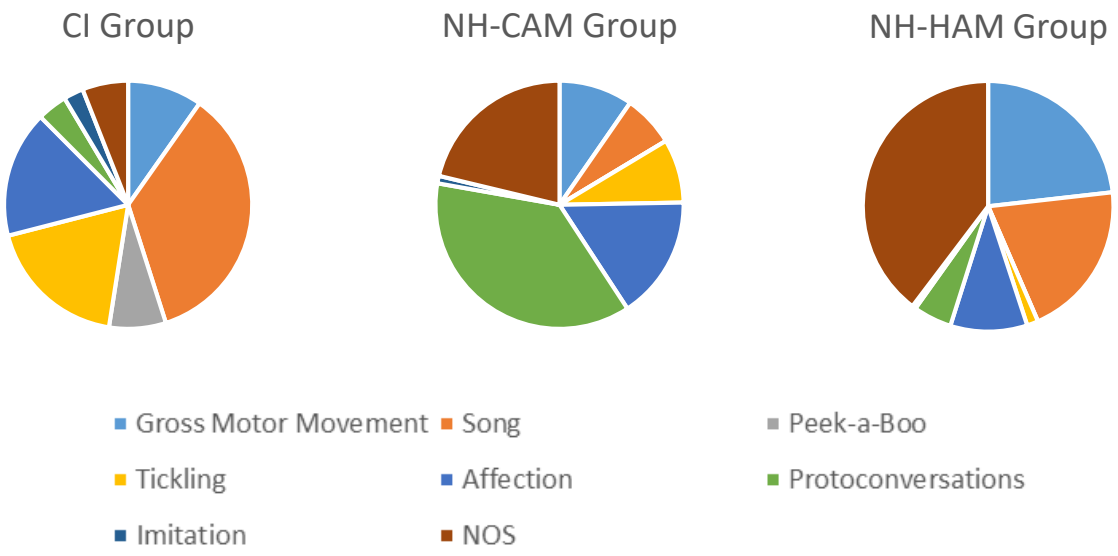


Figure 2. Dyadic Play Subcategory Breakdown of CI Group, NH-CAM Group, and NH-HAM Group

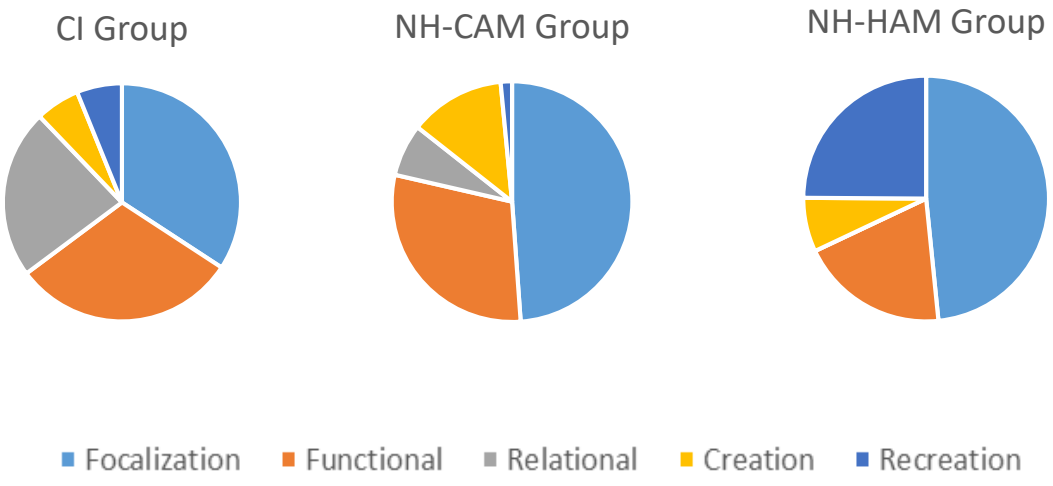


Figure 3. Object Play Subcategory Breakdown of CI Group, NH-CAM Group, and NH-HAM Group

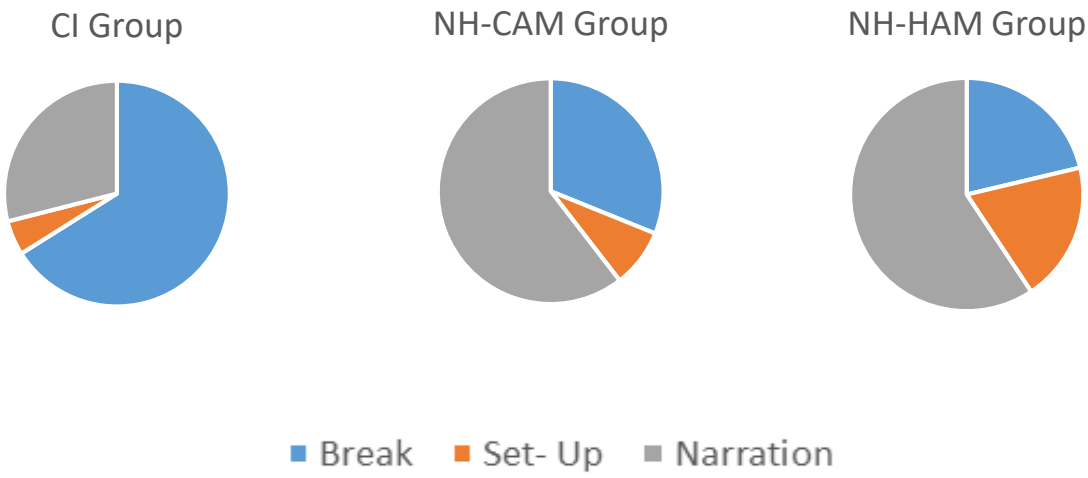


Figure 4. Independently Engaged Subcategory Breakdown CI Group, NH-CAM Group, and NH-HAM Group

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